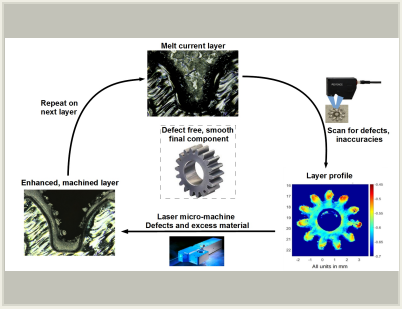
Selective Laser Ablation and Melting, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

In this project Advratech will develop a new additive manufacturing (AM) process called Selective Laser Ablation and Melting (SLAM). The key innovation in this project is the implementation of laser micromachining - guided by high resolution surface profilometry - as a subtractive method for making in-process corrections to traditional SLM builds. Currently such an approach to hybrid AM has not been created, but will significantly advance the state-of-the-art for advanced metallic materials manufacturing. The SLAM process will build a layer of a part by conventional SLM, immediately determine deviations from intended part tolerance - which may result either from normal limits of SLM resolution or errors in powder spreading - and then use the micromachining laser to correct those deviations before continuing to the next layer of the build. Unlike other AM processes, SLAM will be able to produce micron-precision features and smooth surfaces on complex internal part structures that cannot be obtained by any other means. It will also produce high resolution external surface features and minimal roughness levels that will require little or no post-processing. Finally, by elimination of small build errors in situ, before they can propagate into larger errors, it will greatly enhance reliability relative to traditional SLM methods and current hybrid AM methods, leading to higher part confidence, better process documentation (LLP data can be stored to inform digital thread records and digital twin models), and thus easier part certification. A new AM process with these improvements has been identified an area of need for NASA, where current processes struggle to produce validated, defect free parts in a reliable fashion. By achieving these improvements SLAM will also reduce costs and lead-time. Manufacturing possibilities are increased as well by enabling micro-AM components or internal features.



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Small Business Innovation Research/Small Business Tech Transfer

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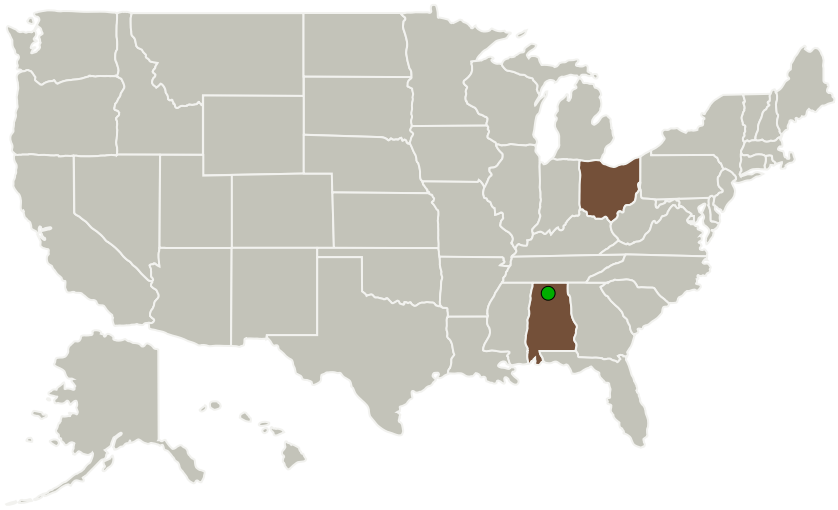
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Advratech LLC	Lead Organization	Industry	Dayton, Ohio
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Ohio

Project Transitions

June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139920)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Advratech LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

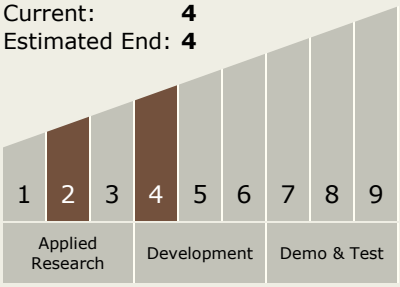
Carlos Torrez

Principal Investigator:

John Middendorf

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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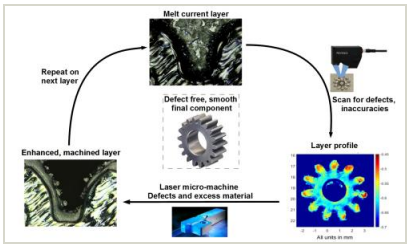
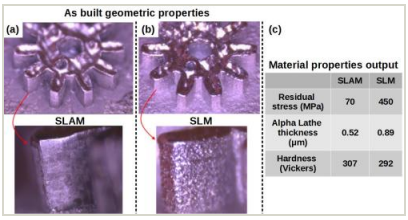
Images



Briefing Chart Image
Selective Laser Ablation and Melting, Phase I
(https://techport.nasa.gov/image/132999)



Final Summary Chart Image
Selective Laser Ablation and Melting, Phase I Project Image
(https://techport.nasa.gov/image/129742)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.1 Manufacturing Processes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System